Advanced Fuel Cycle Initiative

Presentation at the
AFCI Semiannual Review Meeting
Santa Fe, New Mexico

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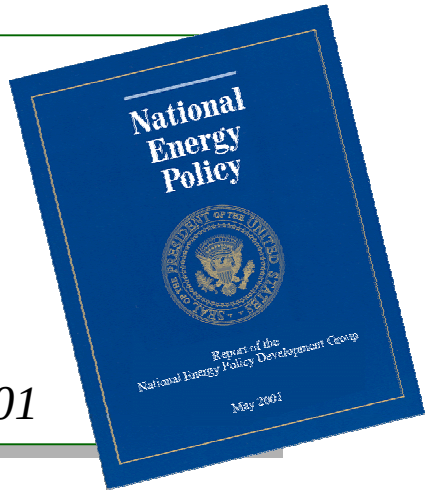
The National Energy Policy and Nuclear Power

"The NEPD Group recommends that the President support the expansion of nuclear energy in the United States as a major component of our national energy policy."

Report of the National Energy Policy Development Group, May 2001



Calvert Cliffs Nuclear Power Plant

Recommendations:

- Support expansion of nuclear energy in the United States
- Develop advanced nuclear fuel cycles and next generation technologies
- Develop advanced reprocessing and fuel treatment technologies

Advanced Fuel Cycle Initiative – *Vision*

- **AFCI will enable sustainable nuclear energy production by creating state-of-the-art technologies for closing the nuclear fuel cycle**
  - Retaining the nuclear option promotes national energy security
  - Maximizes use of domestic energy source
  - Mitigates adverse effects of energy production on environmental integrity

- **AFCI will find a long-term, environmentally, socially, economically and politically acceptable solution for the "nuclear waste problem"**

Advanced Fuel Cycle Initiative – Mission:
Proliferation-Resistant Nuclear Future

- **Develop fuel cycle technologies that:**
  - Enable recovery of the energy value from commercial spent nuclear fuel
  - Reduce the quantity and radiotoxicity of high-level nuclear waste bound for geologic disposal
  - Reduce the inventories of civilian plutonium in the U.S.
  - Enable more effective use of the currently proposed geologic repository and reduce the cost of geologic disposal

January 2003

http://www.nuclear.gov/AFCI_RptCong2003.pdf

- **These technologies will be needed for the Generation IV Nuclear Energy Systems**

AFCI Supports Generation IV Nuclear Energy Systems

♦ **Gen IV "Thermal"**
- VHTR ⟶ NGNP
- SCWR

♦ **Gen IV "Fast"**
- GFR
- LFR
- SFR

→ **U.S. Fast Reactor**

AFCI will support Gen IV by developing fuels and fuel cycle technologies

Requirements for A Next-Generation Nuclear Plant (NGNP) Project

- Collaborative with international community
- Collaborative with industry -- especially utilities
- Demonstrate H_2 production and advanced electricity
- Result in a commercially viable plant design

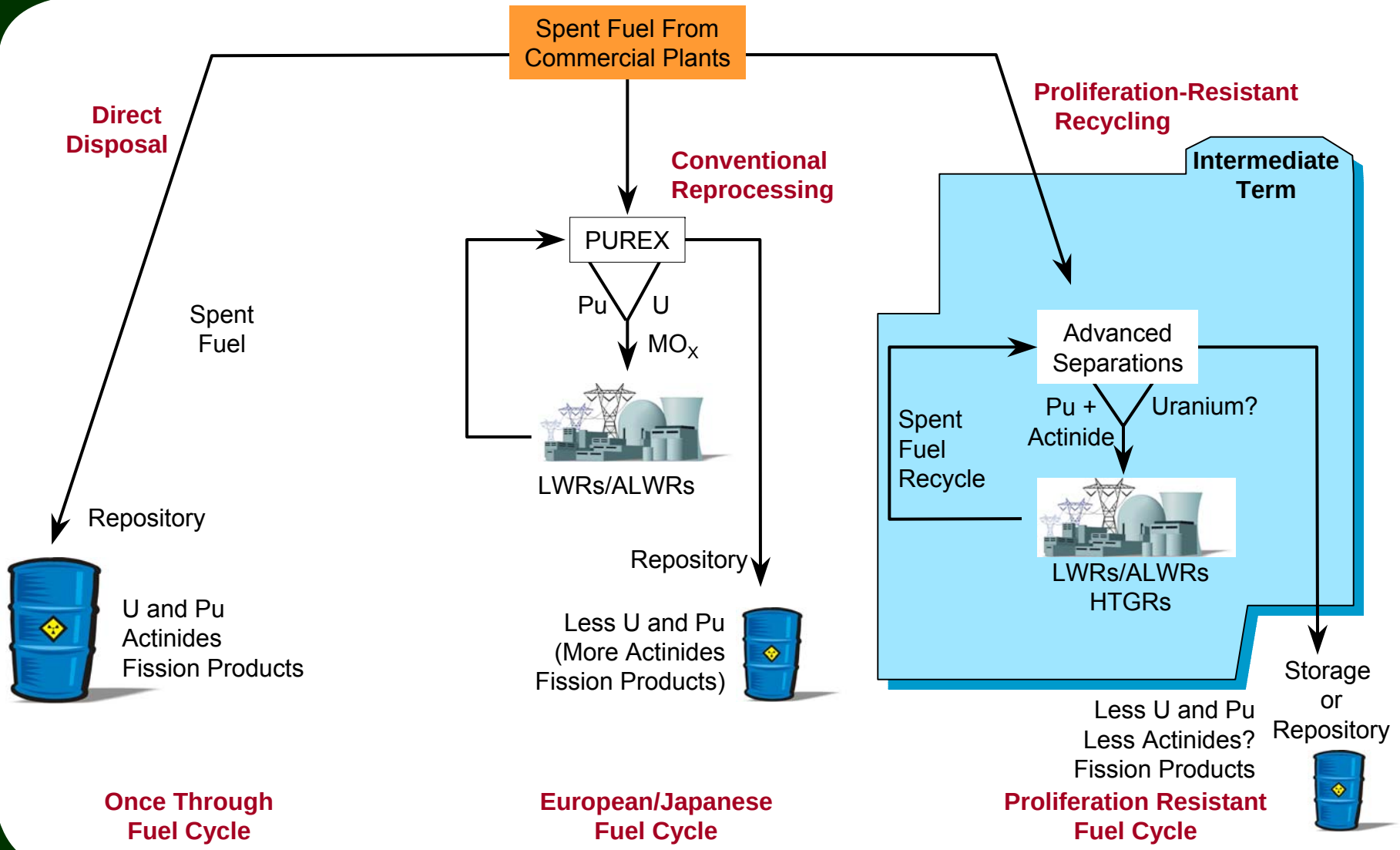
Advanced Fuel Cycle Initiative:
Changes in Program Direction

- **Shift from early implementation of technologies to focused R&D to inform the Secretarial recommendation in 2007-2010 on need for second repository**
- **Defer indefinitely design of large scale Spent Fuel Treatment Facility**
- **Reduce scope of UREX+ Engineering Scale Experiment**
- **Investigate other advanced aqueous processes**
- **More emphasis on systems analysis including modeling**

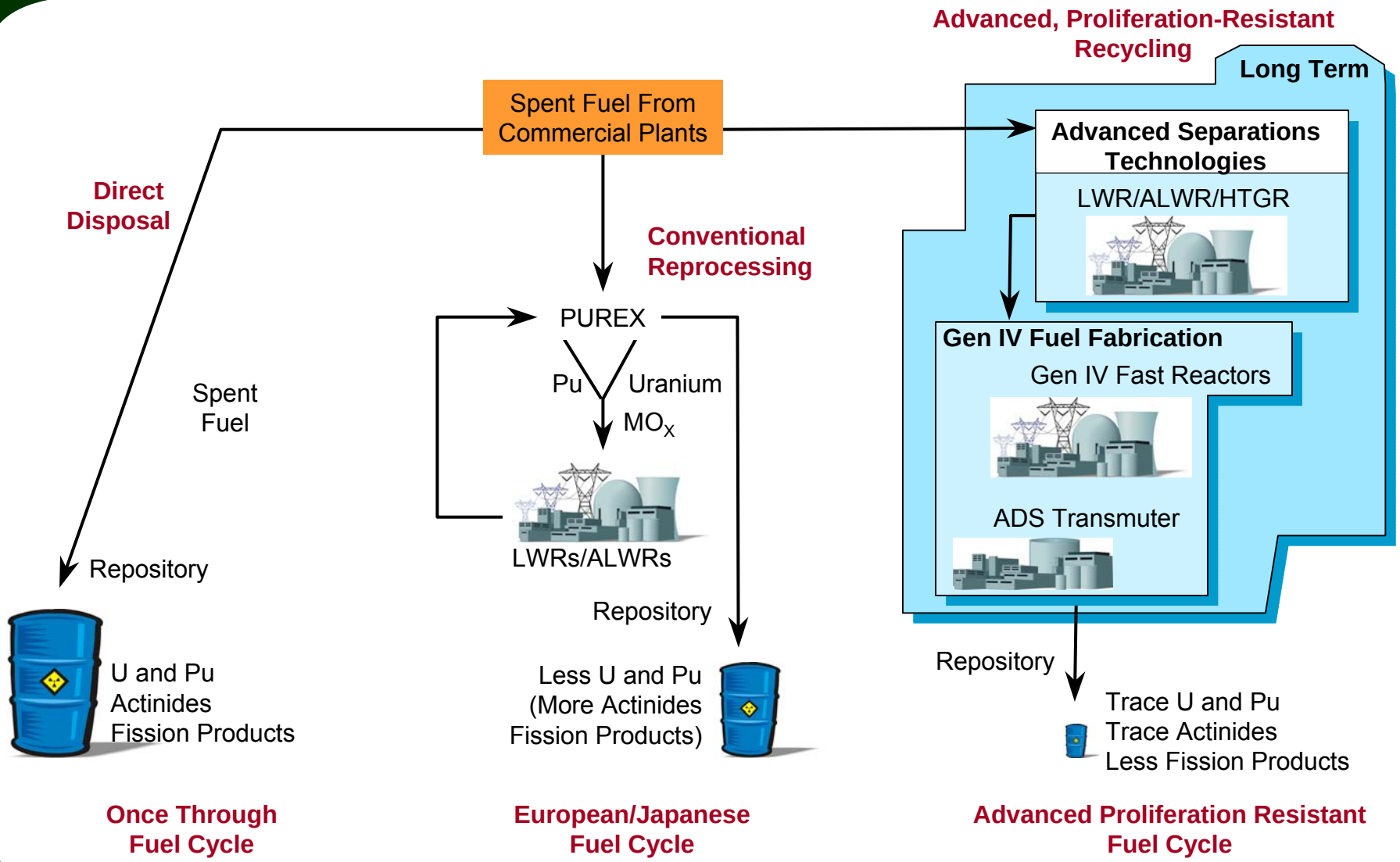
Integrated Program Approach

- **No more Series One and Series Two: Single, integrated approach to nuclear fuel cycle**
- **Intermediate term and long-term technologies**
- **Technologies for thermal and fast transmutation systems**
- **Advanced aqueous and pyroprocessing separations technologies**

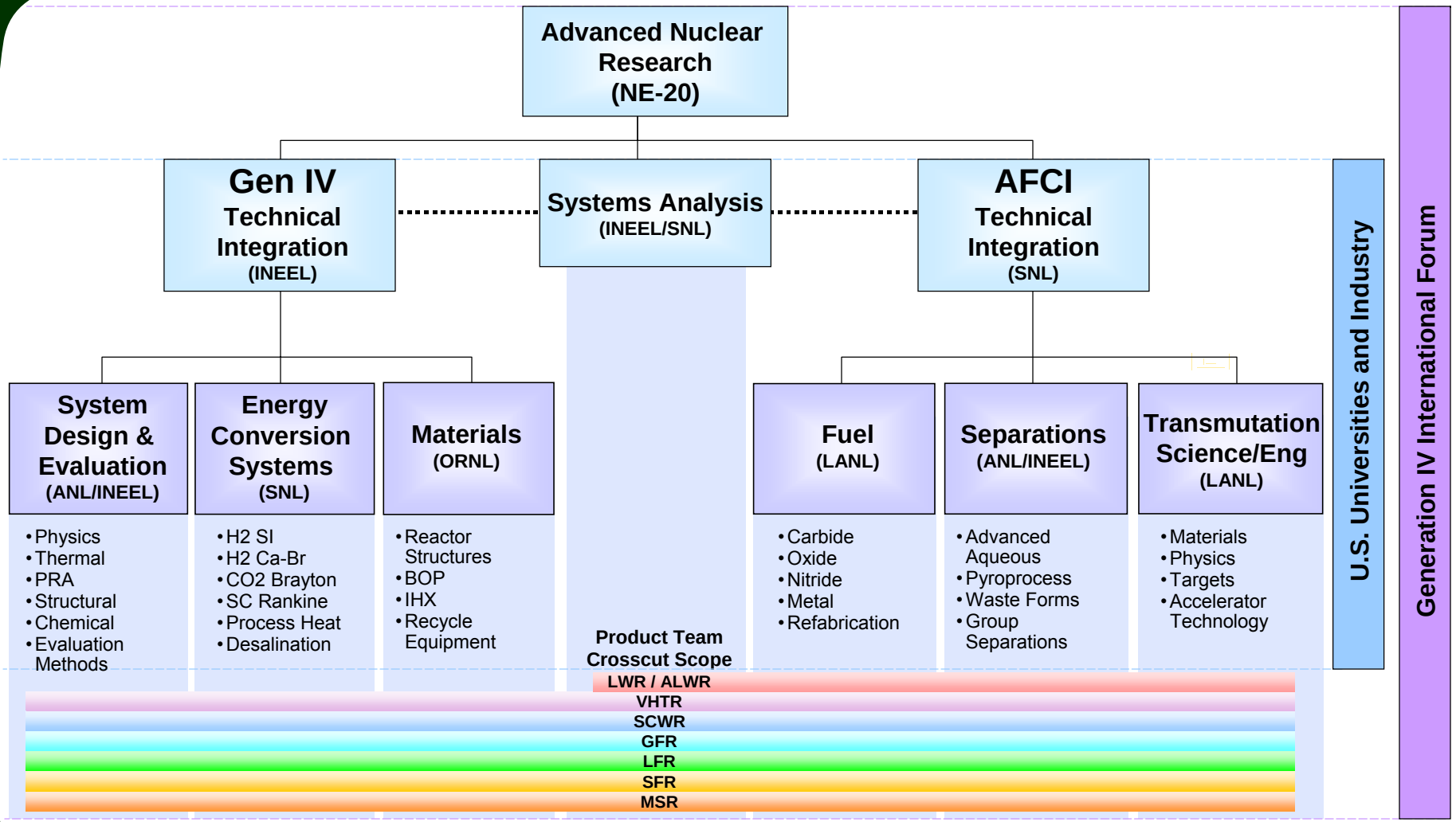
Approaches to Spent Fuel Management :
Intermediate-Term Technologies



Approaches to Spent Fuel Management:
Long Term Technologies



An Integrated Program:
Generation IV and Advanced Fuel Cycle Initiative



DOE HQ Reorganization of AFCI Management

- **Program Director – Savage**
- **Separations – Bresee; Lesica Backup. Lesica lead for EBR-II Spent Fuel Treatment and NEPA**
- **Fuels – Goldner; Feltus lead for all TRISO fuel development**
- **Transmutation Engineering – Goldner; Lesica lead for Materials**
- **Systems Analysis – Goldner, Roth**
- **Program Management and Controls – Newman**
- **Contract Management and Finance being shifted from DOE-Albuquerque to DOE-Idaho by October 1**

AFCI DOE-HQ Activities

- **Two reports to Congress in final review by OMB**
  - Matrix of evaluation of various technology options
  - EBR-II Spent Fuel Treatment Plan
- **Performance Measures and OMB Rating Tool implemented; Ten-Year Plan**
- **Collaboration started with DOE-RW to demonstrate technology feasibility to inform Secretary recommendation on 2nd repository**
- **ANTT NERAC Subcommittee very active**
  - Blue Ribbon Panel on Fuel Cycle Proliferation Resistance Analysis
  - Evaluating MIT Report
  - Next meeting scheduled for Sep. 16-17

AFCI FY 2004 Budget

- President's Budget Request: $63.025 M
- House Mark: $58.5 M
- Senate Mark: $78 M

- FY 2004 program planning currently using Senate mark as baseline
- Hopeful for Appropriation Bill by October 1
- Will use House Mark (close to FY 2003 Appropriation) if forced to operate under a Continuing Resolution
- Energy Policy Bill?

AFCI FY 2004 Budget (Continued)

- **Senate Mark Language:**
  - **Assist the Secretary with development of alternative technology options that may influence decision on 2nd repository**
  - **Explore new and alternative separations technologies**
  - **Study global uranium reserves and demand**
  - **Report to Congress in March 2005**
  - **Use labs and universities for research and systems analysis of reactor and accelerator-based transmutation approaches**
  - **Earmarks:**
    - **$4.5M UNLV**
    - **$1.5 M Idaho Accelerator Center**
    - **$3.0 M directed university research**

A Renewed Commitment

Potential Role of the University Research Community

- **Beginning in FY 2004, DOE will devote a fixed percentage of all Nuclear Energy R&D program funding to conduct university research in areas such as:**
  - Innovative fuels and materials
  - Advanced separations technologies
  - Transmutation technologies -- reactors and accelerator-driven systems
  - Computation and modeling capabilities

- **This is an essential step in assuring a new generation of engineers and scientists for the nuclear future**

New Approach for International Collaborations

- **International Nuclear Energy Research Initiative (INERI) will change in FY 2004**
  - INERI budget request will fund completion of ongoing projects only; no new starts
  - New starts of bilateral international collaborations will be funded by the programs (AFCI, Gen IV, Hydrogen)
  - INERI bilateral agreements will be main mechanism; several new agreements recently signed or close to signing
  - Existing AFCI cooperative agreements and “implementing arrangements” may also be used
  - Collaborations with Europeans on FUTURIX, MEGAPIE, TRADE expected to continue
  - Looking at collaborations with EU, Japan, ROK in next year

A Long-Term Strategy